

Serial No.: 10/588,066
Amdt. dated 27 November 2007
Reply to Office Action of 11 July 2007

REMARKS

As noted previously, the Applicants appreciate the Examiner's thorough examination of the subject application.

Claims 1-21 are pending in the application and were rejected in the Office Action mailed 11 July 2007 on various statutory grounds, described in further detail below. Claims 18-21 were objected to. Claims 18-21 are amended herein. No new matter has been added.

Applicants request reconsideration and further examination of the subject application in light of the foregoing amendments and the following remarks.

Claim Objections

In the Office Action, claims 18-21 were objected to because the Examiner noted that the dependency of the claims appeared to be incorrect. The Examiner noted that in claim 19 there is no positive antecedent for the phrase "the laser head array," and further that it appeared that the claim should actually be dependent from claim 18. By the present amendment, claim 19 has been amended to depend from claim 18, curing the objection.

Additionally, the Examiner noted that claims 18, 20, and 21 appear to incorrectly dependent on claim 16, with the Examiner suggesting that these claims should instead depend from claim 17. By the present amendment, claims 18, 20, and 21 have been amended to depend from claim 17, as the Examiner suggested. Applicants believe the present claim amendments cure the noted objections.

Claim Rejections – 35 U.S.C. § 102

In the Office Action, claims 1-4, 6-19, and 21 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,989,671 to Nakayama et al. ("Nakayama"). Applicants respectfully traverse the rejection and request reconsideration for the following reasons.

Serial No.: 10/588,066
Amdt. dated 27 November 2007
Reply to Office Action of 11 July 2007

For a rejection under 35 U.S.C. § 102(b) to be proper, the cited reference must teach, either expressly or inherently, each and every limitation of the claim(s) at issue. In this situation, Nakayama fails to teach (or suggest) each and every limitation of amended independent claims 1 and 17, from which the remaining claims subject to the rejection depend. Applicants therefore submit that the rejection is improper and should be withdrawn accordingly.

Claim 1 of the subject application, representative of the independent claims, recites the following:

1. (Original) A pre-formatted optical data storage tape comprising:

an elongated linear polymer layer having at least one pattern of optically readable embossments on at least one surface of the polymer layer; and

an optical recording layer covering the pattern of optically readable embossments of the elongated linear polymer layer, wherein the optical recording layer is adapted such that recorded marks may be made in the recording layer by directing a focused source of energy into the recording layer.

[Emphasis added]

Although the Examiner alleges Nakayama and the claims of the subject application share some similar features, such as both being a data storage tape capable of optical recording and both having structures for tracking, a detailed comparison reveals Nakayama discloses an invention that is actually quite different than as claimed in the subject application, e.g., in claim 1.

Nakayama describes a tape storage medium having both magnetic and optical storage functionalities, thereby allowing magnetic (or magneto-optic) and optical recording to occur in the same medium. The medium taught by Nakayama further includes a layer in which track guides are formed. To accommodate both optical and magnetic functionalities, separate optical and magnetic read/write optics and electronics are required, and the media structure, the media manufacturing

Serial No.: 10/588,066
Amdt. dated 27 November 2007
Reply to Office Action of 11 July 2007

scheme, and the media manufacturing hardware described and claimed in Nakayama are all relatively complex.

The claimed subject matter, e.g. the tape of claim 1, on the other hand, recites a novel tape storage system comprising a purely optical medium that is simple in its structure and inexpensive to manufacture, and tape drive hardware that uses multiple inexpensive ("off the shelf") DVD optical components for reading and writing. This system does not require additional magnetic layers or magnetic heads or electronics, yet provides extremely high storage capacity and performance at low cost.

Thus Nakayama describes a dual functionality complex tape medium, while the claims of the subject application are directed to a media/hardware system. The common element in both inventions, the tape, is significantly very different in Nakayama and the subject application, e.g., in terms of structure and method of fabrication.

One of the most significant differences between Nakayama and the Applicants' claimed tape is in the so called "track guides" that Nakayama uses. Such guides are well known in the art and are used in current tape products. The tape taught by Nakayama is structurally magnetic tape with track guides with an added optical storage functionality. In Nakayama, the track guides are formed by the well-known methods of resin hardening by exposure to UV light or by exposure of a photoresist. Alternatively, a photochromic material can be exposed using an appropriate light source to form the desired track guides. To form the track guides, Nakayama describes a UV light source that is focused onto a "track forming layer" (See element 28 in Fig 4. of Nakayama), where the UV light hardens the exposed areas (the track guide). Subsequent processes step are then required to remove the unexposed material by washing, etc. in order to form the track guide. As described and claimed in Nakayama, the exposure of the track guides is a serial process, in that each track guide is written individually. Another Nakayama embodiment is described in which a photomask is used to expose the track guides, again followed by subsequent processing to remove unexposed material.

Serial No.: 10/588,066
Amdt. dated 27 November 2007
Reply to Office Action of 11 July 2007

On the other hand, in Applicants' claims, a high resolution DVD-like preformat pattern is formed on the tape substrate, analogous to the preformat pattern that is injection molded into individual optical discs, but by a continuous mechanical embossing process. This high resolution surface structure is designed to be read by inexpensive DVD heads, where a multiplicity of such heads are used to achieve very high data rates.

The Applicants' claimed preformatting methods are different than and result in several distinct advantages over the prior art, including Nakayama, for example:

- 1) much higher production efficiency (number of tracks formed per unit time);
- 2) higher resolution of preformat patterns; and
- 3) less mechanically and optically complex and expensive.

The system architecture claimed in the subject application also differs from and results in several distinct advantages over the prior art, including Nakayama, for example:

- 4) use of an array of DVD heads results in much higher data rates at a relatively low cost
- 5) independent optical heads compensates for any track pitch variations

To illustrate point (1), *supra*, a typical 1/2-in wide (12.5 mm) optical tape could have 25,000 parallel tracks (at 0.5 micron track pitch). In the claimed systems/methods, all these tracks are made simultaneously; while in Nakayama they are made one at a time. Thus in the claimed systems/methods, 25,000 tracks can be made per unit time, while in Nakayama, one track is made per unit time (in other words, Nakayama will require 25,000 single passes of the complete length of tape to produce the same number of tracks that of the subject application produces in one pass. The methods of the subject application are thus vastly more efficient.

To illustrate point (2), *supra*, Nakayama track guides are formed through the substrate, either

Serial No.: 10/588,066

Amdt. dated 27 November 2007

Reply to Office Action of 11 July 2007

by exposure through a contact mask or by direct writing, and the preferred substrate material is polyester (PET). For printing through a photomask, the smallest features that can be formed using conventional lithographic techniques are typically 2-3 microns, substantially coarser than DVD features. Furthermore, due to the typical thickness variations characteristic of all films, the relatively high birefringence (particularly in PET), and compositional inhomogeneities, the focal spot quality is substantially degraded. The mechanical embossing of the subject application can easily replicate complex format patterns with critical dimensions below 50 nm.

To illustrate point (3), *supra*, formation of high-resolution track guides in Nakayama requires extremely expensive and precise exposure and alignment equipment. The mechanical embossing process of the subject application is very stable, robust, and immune to machine vibrations, even at high line speeds, but a laser exposure system such as proposed by Nakayama must be carefully stabilized and mechanically isolated to eliminate vibration and other effects that degrade the image, particularly at the required high processing speeds. Because the formation of track guides by the UV process requires a special laser, there are additional hardware costs for such a system. In addition, the UV/photoresist processes described in Nakayama for forming the track guides requires additional processing of UV resin or photoresist (exposure, solvent wash, rinse) or use of exotic photochromic materials for the track guides, resulting in higher expense for the process equipment and the media itself.

To illustrate point (4), *supra*, Nakayama requires two different recording methodologies, one for optical recording and one for magnetic recording, with two separate and different electronic & mechanical support requirements, adding cost and complexity. The Applicant's claimed invention can achieve a similar result (dual recording) with two identical optical heads; however, the claimed invention furthermore discloses/utilizes the use of an array of many optical heads, so that, for example, a 4x4 array (16 heads) can achieve a data rate that is more than 800% higher data rate than Nakayama, and 1,600% higher than a DVD. And because DVD heads are a commodity (complete stand-alone DVD recorders can be purchased for \$25), DVD head and electronics assemblies can be

Serial No.: 10/588,066
Amdt. dated 27 November 2007
Reply to Office Action of 11 July 2007

bought for less than \$15/each.

Finally, to illustrate point (5), *supra*, the magnetic recording layer used by Nakayama, like all magnetic systems, must use fixed magnetic heads for reading and writing. In the array of optical heads utilized by the claimed systems/methods, each one (being a DVD head) has its own auto focus and auto tracking capability built in, thus any distortion of the substrate that changes the track spacing (such as temperature variation or stretching of the substrate) does not affect the performance, but a fixed magnetic head, such as with Nakayama or any other magnetic tape system, cannot adjust the relative head spacing to compensate for this effect.

Thus, as is explained by the foregoing remarks, Nakayama does not teach each and every limitation of independent claims 1 and 17, which are the base claims for claims 2-4, 6-16, 18-19, and 21. Therefore, Nakayama is an improper basis for a rejection of claims 1-4, 6-19, and 21 under 35 U.S.C. § 102(b), and Applicants request that the rejection be removed accordingly.

Claim Rejections – 35 U.S.C. § 103

Claim 5

Claim 5 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakayama as applied to claim 4, in further view of U.S. Patent Application No. 2002/0114240 to Chung et al. ("Chung"). Applicants respectfully traverse the rejection and request reconsideration for the following reasons.

Chung is cited by the Examiner as teaching an optical pickup including a compensator, and does not cure the previously-described deficiencies of Nakayama relative to Applicants' claims, e.g., independent claim 1.

One requirement for a rejection under 35 U.S.C. § 103(a) is that the cited reference(s) teach or suggest each and every limitation of the claims(s) at issue. In this situation, the rejection is improper because, as previously noted, Nakayama does not teach or suggest all of the limitations of

Serial No.: 10/588,066
Amdt. dated 27 November 2007
Reply to Office Action of 11 July 2007

independent claim 1, which is the base claim for claim 5. Consequently, the cited combination of Nakayama and Chung is an improper basis for a rejection of claim 5 under 35 U.S.C. § 103(a). Applicants therefore request that the rejection of claim 5 be withdrawn accordingly.

Claim 20

Claim 20 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Nakayama, as applied to claims 16-17, in further view of U.S. Patent Application No. 2005/0063291 to Tsukamoto ("Tsukamoto"). Applicant respectfully traverses the rejection and requests reconsideration for the following reasons.

Tsukamoto is cited by the Examiner as teaching an optical tape medium having side walls of grooves in a "wobbled" configuration, and the reference does not cure the previously-described deficiencies of Nakayama relative to Applicants' claims, e.g., independent claim 17.

One requirement for a rejection under 35 U.S.C. § 103(a) is that the cited reference(s) teach or suggest each and every limitation of the claims(s) at issue. In this situation, the rejection is improper because, as previously noted, Tsukamoto does not teach or suggest all of the limitations of independent claim 17, which is the base claim for claim 20. Consequently, the cited combination of Nakayama and Tsukamoto is an improper basis for a rejection of claim 20 under 35 U.S.C. § 103(a). Applicants therefore requests that the rejection of claim 20 be withdrawn accordingly.

Conclusion

In view of the amendments and remarks submitted herein, Applicant respectfully submits that all of the pending claims in the subject application are in condition for allowance, and respectfully requests a Notice of Allowance for the application.

Authorization is hereby given to charge our deposit account, No. 50-1133, for the fees corresponding to a Petition for Extension of Time (two-months) under 37 CFR § 1.136, and for any other fees that may be required for the prosecution of the subject application.

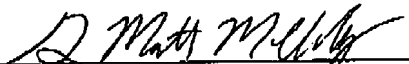
Serial No.: 10/588,066
Amdt. dated 27 November 2007
Reply to Office Action of 11 July 2007

If a telephone conference will expedite prosecution of the application, the Examiner is invited to telephone the undersigned.

Respectfully submitted,

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